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Cal R. Fremling
Winona State University

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SEASONAL ABUNDANCE OF THE TICK
DERMACENTOR PARUMAPERTUS

By

CALVIN FREMLING AND ALLAN GASTFRIEND

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SEASONAL ABUNDANCE OF THE TICK *DERMACENTOR PARUMAPERTUS*¹

The tick, *Dermacentor parumapertus*, which is confined to the arid and semi-arid regions of western United States, has been considered to be of little economic importance. This tick rarely attacks man and for many years has been assumed to be host-specific on the Leporidae. "Stage to stage survival of spotted fever virus has been shown under laboratory conditions and it appears quite probable that within its natural geographical range it [*D. parumapertus*] functions as an agent in the transmission of spotted fever among rabbits" (Parker *et al.* 1937: 60). This tick is a reservoir for tularemia in both rabbit and rodent populations (Woodbury and Parker 1954). Tests performed by personnel of the Rocky Mountain Laboratory show that it also serves as a reservoir for Colorado tick fever (G. M. Kohls, personal communication, 16 Sept. 1953).

A study currently being conducted by one of the co-authors (A.G.) indicates that many species of rodents also serve as hosts for the immature stages of *D. parumapertus*. Hence, this tick may be an important factor in perpetuating and disseminating pathogens within and between rodent and rabbit populations. It was deemed necessary, therefore, to study the seasonal abundance of each developmental stage of *D. parumapertus* in order to understand better this tick's potential ability to transmit microorganisms. The report which follows presents the results of a year's study of the seasonal abundance of *D. parumapertus* as a parasite of the black-tailed jack rabbit, *Lepus californicus*.

This rabbit was used in this study for several reasons. (1) It is known to be susceptible to Rocky Mountain spotted fever, Colorado tick fever and tularemia. (2) It is the common host on which larval, nymphal, and adult stages of *D. parumapertus* are found. (3) It is relatively abundant and available throughout the year. (4) It may be collected easily.

A suitable area with a relatively high rabbit population was selected adjacent to the Great Salt Lake Desert, twelve miles west of the southern end of the Cedar Mountains in Tooele County, Utah. This semi-stabilized sand dune area is three miles long and one-half mile wide. The predominant plants are greasewood (*Sarcobatus vermiculatus*), four-winged salt bush (*Atriplex canescens*), ink weed (*Suaeda torreyana*), shadscale (*Atriplex confertifolia*), rabbit brush (*Chrysothamnus* sp.), sacaton grass (*Sporobolus airoides*), and Indian rice grass (*Oryzopsis hymenoides*). An extensive greasewood and shadscale flat borders the sand dune area.

The annual precipitation in this area is approximately eight inches, more than half of which occurs during March, April, May and June. Mean monthly temperatures of 60° F. occur from May through September. January, the coldest month, exhibits a mean low of 26° F. The temperature extremes recorded in 1953 were 109° F. in July and -15° F. in January. The mean relative humidities ranged from 28.5% in September to 77.9% in January.

The field work for this study was initiated on 1 April 1953 and was continued until 1 April 1954. During this period, five rabbits were collected every seventh day (with minor exceptions). As soon as they were shot, the rabbits were placed in paper bags and the bags were sealed to insure the retention of the parasites. Before subsequent processing was begun in the laboratory, the animals in their containers were refrigerated at -4° F. for two to three hours. This procedure was found to be

the most desirable method of immobilizing the ectoparasites. Although not sufficient to freeze the rabbits, this interval of refrigeration slowed down these extremely active ticks and facilitated collection. Unlike gassing and anesthetizing procedures, refrigeration allowed the parasites to remain alive for further studies.

At the end of the refrigerating period, each rabbit was placed in a large, deep collecting pan. The paper bag containers were examined and the detached ticks were collected; those which remained attached to the rabbit were removed with forceps. While held over the pan, the animal was thoroughly brushed to remove the remaining parasites. To insure a complete collection of the larvae and nymphs, the pan and the accumulated sand and debris were examined under a binocular dissecting microscope. The ticks were preserved in 70% alcohol or were kept alive for further study. *Cuterebra* larvae, fleas, lice and heleid gnats found during the processing were also collected, but are not treated in this report.

Each tick was examined microscopically to determine its species, sex, and stage of development. Records were kept of the numbers of larvae, nymphs and adults which were removed from each host. The weekly average per rabbit for each of these stages is presented in the graphs.

During the course of this investigation, 8180 ticks of the species *D. parumapertus* were collected and examined. The most heavily infested rabbit was collected on May 7 and was found to harbor 447 ticks. Two additional species of ticks were found on the rabbits. One hundred and fifty-nine *Otobius lagophilus* were found on six of the animals and one *Haemaphysalis leporis-palustris* was collected.

Fleas (*Pulex irritans*) were collected from nineteen rabbits. Sucking lice (*Haemodipsus setoni*) were collected from one rabbit, and heleid gnats (*Culicoides* sp.) were found engorged on another. *Cuterebra* larvae were abundant throughout the summer months.

ADULTS

The adult population of ticks reached its peak in the latter part of July (Fig. 1). This peak is produced by the summation of adults recently molted from nymphs and overwintering adults that had not engorged during the previous season. The adult population was consistently low throughout the rest of the year.

Females were more numerous than males during the period between 29 July and 23 September. The females were engorging at this time in preparation for egg

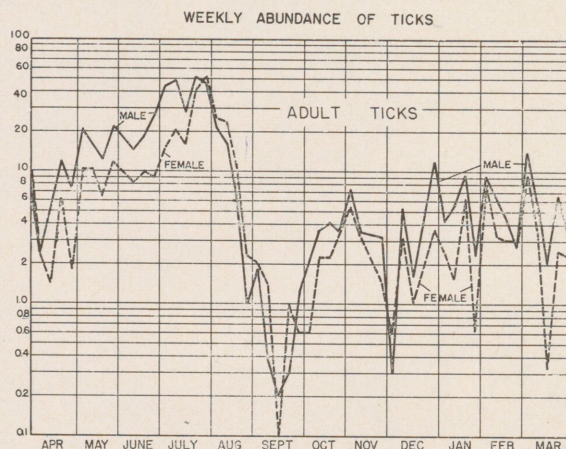


FIG. 1. Average number of adult male and female *Dermacentor parumapertus* ticks per rabbit for each week through one annual cycle.

¹ The authors wish to express their sincere appreciation to the staff of Ecological Research for their assistance in this study.

laying. Except for this relatively brief seven-week period males predominated. Of the total number of adult ticks collected during this study, 59% were males.

NYMPHS

The nymphs were most abundant during the moist months of April, May and June (Fig. 2). It may be noted that there is considerable fluctuation in graphs of both nymphs and larvae. The authors feel that these fluctuations would probably smooth out with larger samples. However, the data seem adequate to indicate the general relationships of larvae, nymphs and adults.

Since ticks stand a very poor chance of surviving through the winter in the engorged state (Hooker *et al.* 1912), it seems probable that the spring nymphal population wintered in the unengorged state rather than as engorged larvae. No nymphs were collected between early July and late September 1953. The relatively large number taken during October probably developed from larvae which molted following estivation, and found a host before the onset of cold weather.

LARVAE

The larvae, like the nymphs, were most abundant during the spring months (Fig. 2). They appeared suddenly during the latter part of February, and large numbers were collected until the middle of May. Following the spring peak, there was a gradual decrease in numbers until the larvae disappeared completely in the middle of June. A relatively large population appeared again in the early part of October and declined abruptly in the same month. From the 21 October until 25 November, a very small number of larvae were collected each week. A short-lived peak occurred on 2 of December and disappeared completely two weeks later. Larvae were virtually non-existent until 17 February 1954.

It is probable that the spring larval peak results from the hatching of eggs which over-wintered. Moisture is essential to the immature forms, and the complete disappearance of the larvae during the extremely dry summer months indicates a period of estivation.

The October larval peak may be due to (1) those larvae which estivated after failing to find a host the preceding spring, and/or (2) the larvae which hatched from eggs deposited by the females early in the season.

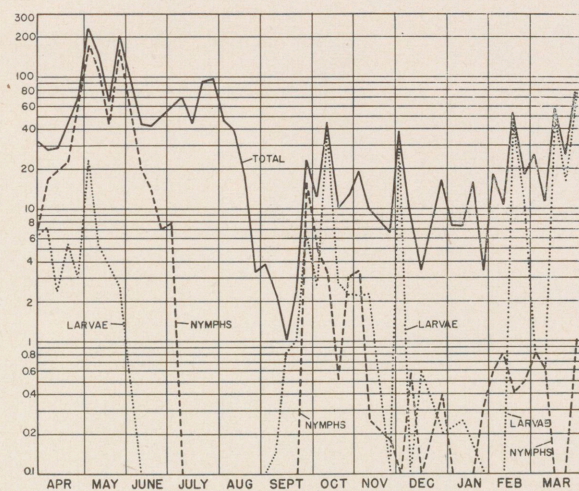


FIG. 2. Average number of nymphs and larvae and the total numbers of all stages of *Dermacentor parumapertus* ticks per rabbit for each week through one annual cycle.

The abrupt peak which occurred in December may be a reflection of hibernating ticks which were reactivated, for a short time, by unseasonably warm weather.

If the tick population trends observed in this study are typical, the following conclusions may be drawn:

- (1) Larval populations on the jack rabbit are not of sufficient magnitude to maintain the high nymphal populations found on these animals.
- (2) Larval ticks must frequently use hosts other than the jack rabbit in order to maintain this high nymphal population. The subject of alternate hosts for *D. parumapertus* will be treated in greater detail in a subsequent report.

SUMMARY

An investigation was made of the seasonal abundance of the tick, *Dermacentor parumapertus*, which is parasitic on the black-tailed jack rabbit, *Lepus californicus*. This one-year study was made in a vegetated sand dune area in Tooele County, Utah. Approximately 8300 ectoparasites were collected and identified in addition to the quasi-endoparasitic *Cuterebra* (rabbit botfly) larvae. The six species of ectoparasites represented consisted of three species of ticks, one of fleas, one of sucking lice, and one of heleid gnats. *D. parumapertus* is by far the most abundant ectoparasite found on the jack rabbit.

Ticks of the species *D. parumapertus* were found on jack rabbits throughout the year, but maximum infestation occurred in May. Approximately 75% of this spring population was composed of nymphs. Larvae were also numerous in the spring, but at no time did they reach the proportions of the nymphal population. The adult ticks were most numerous in July.

The relationships of the larval and nymphal populations found on *L. californicus* indicate that *D. parumapertus*, long thought to be host specific to the Leporidae, is parasitic in its larval stage on hosts other than the jack rabbit.

In this region where rodents and rabbits are agricultural pests, *D. parumapertus* may be of considerable economic importance as a vector of the diseases endemic in these populations.

SELECTED BIBLIOGRAPHY

- Banks, Nathan. 1908. A revision of the Ixodoidea, or ticks, of the United States. Tech. ser. U. S. Dept. Agric., Bur. Entomol., Tech. ser. 15, 60 pp.
- Cooley, R. A. 1938. The genera *Dermacentor* and *Otocentor* (Ixodidae) in the United States, with studies in variation. U. S. Publ. Health Serv., Natl. Inst. Health, Bull. 171. 89 pp.
- Holdenried, R., F. C. Evans, and D. S. Longanecker. 1951. Host-parasite-disease relationships in a mammalian community in the Central coast range of California. Ecol. Monogr. 21: 1-18.
- Hooker, W. A., F. C. Bishopp, and H. P. Wood. 1912. The life-history and bionomics of some North American ticks. U. S. Dept. Agric., Bur. Entomol., Bull. 106, 239 pp.
- Parker, R. R., C. B. Philip, G. E. Davis, and R. A. Cooley. 1937. Ticks of the United States in relation to disease in man. J. Econom. Entomol., 30: 51-69.
- Woodbury, A. M., and D. D. Parker. 1954. Studies of tularemia, *Pasteurella tularensis*. Univ. of Utah, Ecological Research Series: Ecology of the Great Salt Lake Desert, June 1, 1953. 14 pp.

CALVIN FREMLING
ALLAN GASTFRIEND

ECOLOGICAL RESEARCH
UNIVERSITY OF UTAH
DUGWAY, UTAH